Improved Pore-Scale Models of $CaCO_3$ Precipitation

Scientific Achievement

Developed coupled reactive transport pore-scale models with highly resolved hydrodynamic flow fields that capture precipitation/dissolution rates in pore-scale micro-fluidic experiments.

Significance and Impact

Improved understanding of the fundamental physio-chemical processes of $CaCO_3$ precipitation and dissolution at the pore scale under various geochemical conditions perturbed by geological CO_2 injection and leakage.

Publications

Davison, S. M., H. Yoon, and M. J. Martinez (2012), Pore scale analysis of the impact of mixing-induced reaction on viscosity variations, *Advances in Water Resources*, *38*, 70-80.

Fanizza, M. F., H. Yoon, C. Zhang, M. Oostrom, T. W. Wietsma, N. J. Hess, M. E. Bowden, T. J. Strathmann, K. T. Finneran, and C. J. Werth (2013), Pore scale evaluation of uranyl phosphate precipitation in a model groundwater system, *Water Resources Research*, *49*(874-890).

Yoon, H., and S. A. McKenna (2012), Highly parameterized inverse estimation of hydraulic conductivity and porosity in a three-dimensional, heterogeneous transport experiment, *Water Resources Research 48*(10).

Yoon, H., A. J. Valocchi, C. J. Werth, and T. Dewers (2012), Pore-scale simulation of mixing-induced calcium carbonate precipitation and dissolution in a microfluidic pore network, *Water Resources Research*, *48*.

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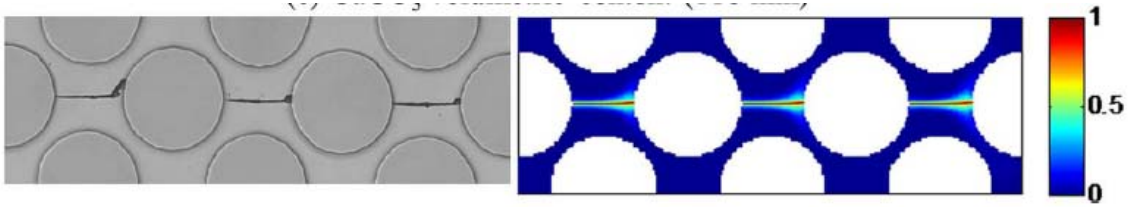

Image of experimental $CaCO_3$ precipitates (left) and simulated $CaCO_3$ volumetric content (right) at 118 minutes after start of experiment.